GREG WILLIAMS
Senior Research Scientist
Pacific Northwest National Laboratory
Battelle Marine Sciences Laboratory
1529 W. Sequim Bay Road
Sequim, Washington 98382
Ph. 360-681-3655
E-mail: Gregory.Williams@pnl.gov

EDUCATION

- M.S. Fisheries Biology, 1994, University of Washington, School of Fisheries and Oceanography, Seattle, WA
- B.S. Biology, 1989, Washington and Lee University, Lexington, VA

QUALIFICATIONS:

Greg Williams has a strong complementary background in fisheries, estuarine and nearshore marine science, and restoration ecology. Mr. Williams has worked on a variety of wetland restoration projects, longterm monitoring and nearshore habitat studies, and various fish and invertebrate ecology research topics. At Battelle, Mr. Williams' research has focused on several important issues in the Pacific Northwest, including nearshore habitat, restoration issues (both saltmarsh and eelgrass), and fish/salmonid behavior. His research interests are directed toward understanding the functional attributes of natural marsh/nearshore marine systems, especially to juvenile life history stages of various fish species, and how to restore and monitor these attributes over the long term.

Mr. Williams' current projects involve developing and critically examining marsh restoration plans and monitoring protocols, and monitoring eelgrass restoration projects, including an analysis and synthesis of historic eelgrass restoration data (e.g., Clinton ferry terminal, Eagle Harbor). He is also conducting assessments of benthic and rocky marine habitats, including geoduck, rockfish, benthic invertebrate, and macroalgae surveys (e.g., Hood Canal Bridge, Clinton ferry terminal). Recent fisheries studies involve examining the behavior of outmigrating juvenile salmonids past shoreline structures like ferry terminals and developing field protocols for assessing successful juvenile salmonid passage through retrofitted culverts, both of which are for the Washington State Department of Transportation. In addition, Mr. Williams is addressing issues relative to shoreline armoring, more specifically, developing monitoring studies to assess the effects of shoreline modifications/armoring techniques on various taxa (vegetation, fish, epibenthos, benthos), and conducting literature surveys and paper studies of the Puget Sound nearshore ecosystem.

Mr. Williams also has over 10 years experience as a research diver. He has conducted underwater SCUBA surveys in various environments, ranging from tropical Caribbean reef systems to the cool, temperate waters of Puget Sound. A sample of his diving projects includes monitoring and assessment of fauna associated with habitat enhancement (artificial reef) projects, identification of critical nearshore habitats, eelgrass monitoring and restoration, geoduck surveys, and fishery-related assessment surveys. He is familiar with several tools to support underwater research, such as still photography and videography, and has used various techniques to assess resources in the underwater environment.

PROJECT EXPERIENCE:

- **Coastal Wetland Restoration Studies:** Mr. Williams has over 5 years experience as a research scientist at the Pacific Estuarine Research Lab in San Diego, California, during which time he was responsible for conducting long-term baseline monitoring of water quality and plant, fish, and invertebrate populations at three coastal wetlands. His research included the development of wetland habitat restoration criteria; fish and invertebrate habitat functional assessments; the study of food-web

interactions among marsh fish assemblages; estimation of impacts of exotic species introductions; and the evaluation of species trends and anomalies during El Niño.

- **Artificial Reef Habitat Studies in Puget Sound:** As a research biologist and research diver for the Washington Department of Fish and Wildlife, Mr. Williams monitored artificial reef habitats and identified juvenile marine fish for studies associated with marine habitat enhancement projects in Puget Sound, Washington.
- **Caribbean Marine Research Center Ecology Studies:** At this NOAA facility in the Bahamas, Mr. Williams served as a volunteer research biologist where he assisted in research directed at understanding the recruitment ecology of Caribbean spiny lobster and Nassau grouper. The study involved estimating environmental variables controlling recruitment variability, identifying critical nearshore habitats, conducting plankton tows and SCUBA surveys, and monitoring larval collection.
- **Fisheries Studies in Northwest Estuarine Habitats:** Mr. Williams' graduate research at the University of Washington School of Fisheries and Oceanography was on the effects of habitat modification on distribution and diets of intertidal fishes in Grays Harbor Estuary, Washington. During this time, he gained extensive experience in the design, construction, and use of sampling equipment and techniques (beam and otter trawls, beach seines, SCUBA transects, benthic cores), studies of Pacific Northwest estuarine habitats, and fish and invertebrate identification. He also catalogued marine fish eggs and larvae from the National Marine Fisheries Center's annual abundance surveys and gained expertise in the taxonomic identification of larval fishes.
- **Crustacean Ecology Studies:** Mr. Williams assisted in the monitoring of long-term estuarine Dungeness crab recruitment and was a research diver for Puget Sound Dungeness crab population and reproductive studies for the University of Washington. He also conducted fecundity studies for Bering Sea decapod crustacea, sorted benthic samples and identified invertebrate taxa, and aged bivalve shells.
- **Groundfish Studies:** Mr. Williams participated in a Pacific groundfish bycatch study for the University of Washington Fisheries Research Institute, which examined the effects of experimental codend mesh sizes aboard 14 active fishing vessels along the West Coast (Monterey, CA, to Bellingham, WA). Duties included identification of Pacific marine fishes, collection of pertinent life history information, logistical planning, and negotiation.
- **Chesapeake Bay Oyster Ecology:** While at the Horn Point Environmental Lab at the University of Maryland, Cambridge, MD, Mr. Williams monitored oyster recruitment and assisted in the design and logistics of a study examining predation on oyster spat in the Chesapeake Bay.

MEMBERSHIP AND AFFILIATIONS:

- Member, Estuarine Research Federation (ERF)
- Member, Gilbert Ichthyological Society
- Member, Southern California Academy of Sciences
- Member, Pro Esteros

CERTIFICATIONS:

SCUBA

- PADI (Professional Association of Dive Instructors), Openwater SCUBA Diver, April 1990
- NAUI (National Association of Underwater Instructors) Advanced diver

SCUBA Support

- Current First Aid/CPR

- Dive Rescue O2 Administration
- Nitrox Diving Certification

PUBLICATIONS:

Peer Reviewed Publications

Williams, G. D., J. West, and J. B. Zedler. *In press.* "Shifts in fish and invertebrate assemblages of two southern California estuaries during the 1997-98 El Niño." *Bulletin of the Southern California Academy of Sciences.*

Zedler, J. B. Harding, E. Paling, G. Williams. *In review.* "Inter-continental comparisons of marsh restoration challenges," ed. Peter Bowler.

Callaway, J., G. Sullivan, J. Desmond, G. Williams, and J. Zedler. 2001. "Assessment and monitoring." In *Handbook for Restoring Tidal Wetlands,* ed. J. Zedler, pp. 271-336. CRC Press, Boca Raton, Florida.

Desmond, J. S., J. M. West, and G. D. Williams. 2001. Appendix 5: "Ecological and life history characteristics of common southern California salt marsh invertebrate species." In *Handbook for Restoring Tidal Wetlands,* ed. J. Zedler, pp. 401-410. CRC Press, Boca Raton, Florida.

Madon, S. P., G. D. Williams, J. M. West, and J. B. Zedler. 2001. "The importance of marsh access to growth of the California killifish, *Fundulus parvipinnis*, evaluated through bioenergetics modeling." PNWD-SA-5441. *Ecological Modeling* 136:149-165.

Williams, G. D., J. West, and J. B. Zedler. *In press.* "Shifts in fish and invertebrate assemblages of two southern California estuaries during the 1997-98 El Niño." *Bulletin of the Southern California Academy of Sciences.*

Williams, G. D. and J. S. Desmond. 2001. "Restoring assemblages of invertebrates and fishes." In *Handbook for Restoring Tidal Wetlands,* ed. J. Zedler, pp. 235-269. CRC Press, Boca Raton, Florida.

Williams, G. D., J. S. Desmond, S. P. Madon, and J. M. West. 2001. Appendix 6: "Habitat functional requirements for common fish species in southern California saltmarshes, lagoons, and estuaries." In *Handbook for Restoring Tidal Wetlands,* ed. J. Zedler, pp. 411-423. CRC Press, Boca Raton, Florida.

Desmond, J. S., G. D. Williams, and J. B. Zedler. 1999. "Fish use of tidal creek habitats in two southern California salt marshes." *Ecological Engineering* 14:233-252.

Desmond, J. S., G. D. Williams, J. B. Zedler. 1999. "Improving the design of fish habitat mitigation projects in southern California. 2nd Interface Between Ecology and Land Development in California." In *Proceedings of the Second Annual Symposium,* eds. J.E. Keeley, M. Baer-Keeley, and C.J. Fotheringham. Los Angeles, California, April 1997 International Association of Wildland Fire, Fairfield, Washington.

Williams, G. D., J. Callaway, M. Wells, J. Jackson. 1999. "Monitoring and managing Los Peñasquitos Lagoon's biological resources: Effects of a rapidly changing watershed." In *Coastal Zone 99: Abstracts of Presentations.* July 27-29, 1999, San Diego, California.

Williams, G. D. and J. B. Zedler. 1999. "Fish assemblage composition in constructed tidal channels of a southern California salt marsh: Influence of channel morphology and alteration history." *Estuaries*. 22:702-716.

Zedler, J. B., J. C. Callaway, J. S. Desmond, G. Vivian-Smith, G. D. Williams, G. Sullivan, A. E. Brewster, and B. K. Bradshaw. 1999. "Californian salt-marsh vegetation: an improved model of spatial pattern." *Ecosystems* 2(1):19-35.

Williams, G. D., J. S. Desmond, and J. B. Zedler. 1998. "Extension of two nonindigenous fishes, *Acanthogobius flavimanus* and *Poecilia latipinna*, in San Diego Bay marsh habitats." *California Fish and Game*, 84:1-17.

Zedler, J. B., K. E. Boyer, G. D. Williams, and J. C. Callaway. 1998. "Creating intertidal habitat for endangered species in southern California: Achievements and challenges." In *Wetlands for the Future*, eds. A. J. McComb and J. A. Davis. Proceedings of INTECOL's V International Wetlands Conference, Gleneagles Press, Adelaide, Australia.

Zedler, J.B., J. Desmond, S. Phinn, B. Nyden, G. Sullivan, G. D. Williams, J. Callaway, K. E. Boyer, A. N. Powell. 1998. "New tools for assessing coastal habitats." In *California and the World Ocean '97: Taking a look at California's ocean: An Agenda for the Future*, ed. O.T. Magoon, pp. 1016-1027. American Society of Civil Engineers, San Diego, California.

Haltiner, J., J. B. Zedler, K. E. Boyer, G. D. Williams, and J. Callaway 1997. "Influence of physical processes on the design, functioning, and evolution of restored tidal wetlands in California." *Wetlands Ecology and Management*, 4:73-97.

Zedler, J. B., G. D. Williams and J. Desmond. 1997. "Wetland mitigation: Can fishes distinguish between natural and constructed wetlands?" *Fisheries* 22:26-28.

Reports:

Battelle Marine Sciences Laboratory (G.D. Williams, R. M. Thom, D. Woodruff, A. Borde, A. Skillman, M. Miller, R. Kropp, S. Blanton), Pentec Environmental (Jim Starkes, Jon Houghton), Striplin Environmental Associates, Shapiro Associates, King County DNR (Laura Blackmore, Jim Brennan). *In Review* (2001). *State of the Nearshore Ecosystem: Central Puget Sound including Vashon and Maury Islands (WRIAs 8 and 9)*. Prepared for King County Department of Natural Resources, Seattle, Washington. 266 pp.

Borde, AB, DL Woodruff, RM Thom, JA Southard, and GD Williams. 2001. "Assessment of Eelgrass *(Zostera marina)* Presence and Condition in Rich Passage in June 2001." PNWD-3102. Letter report to the Washington State Department of Transportation by Battelle Marine Sciences Laboratory, Sequim, Washington.

Southard, JA, GD Williams, CJ Deblois, and N Evans. 2001. "Juvenile Coho Upstream Movement Study in Snow Creek and Andrews Creek, Washington." PNWD-3105. Letter report to the Washington State Department of Transportation and the University of Washington by Battelle Marine Sciences Laboratory, Sequim, Washington.

Southard, JA, GD Williams, RM Thom, SL Blanton, and AB Borde. 2001. *Eelgrass Restoration at West Eagle Harbor. Phase II: Monitoring and Evaluation*. PNWD-3097. Prepared for the Washington State Department of Transportation by Battelle Marine Sciences Laboratory, Sequim, Washington.

Williams, GD, AB Borde, and Thom RM. 2001. "Codiga Farm Wetland Restoration Plan: Vegetation Guidance and Design Review." PNWD-3104. Letter report to the U.S. U.S. Army Corps of Engineers, Seattle District, by Battelle Marine Sciences Laboratory, Richland, Washington.

Williams, GD, JA Southard, SL Blanton, and RM Thom RM. 2001. *Findings of Subtidal Dive Resource Surveys: Anchor Cable BN, Hood Canal Bridge*. PNWD-3100. Prepared for the Washington State Department of Transportation by Battelle Marine Sciences Laboratory, Sequim, Washington.

Williams, GD, JA Southard, SL Blanton, and RM Thom RM. 2001. *Geoduck Dive Resource Surveys: Anchor Cable BN, Hood Canal Bridge*. PNWD-3101. Prepared for the Washington State Department of Transportation by Battelle Marine Sciences Laboratory, Sequim, Washington.

Williams, GD., and RM. Thom. 2001. *Development of Guidelines for Aquatic Habitat Protection and Restoration: Marine and Estuarine Shoreline Modification Issues*. PNWD-3087. Prepared for the Washington State Department of Transportation, Washington Department of Fish and Wildlife, and the Washington Department of Ecology, by Battelle Marine Sciences Laboratory, Sequim, Washington.

Woodruff, DL, AB Borde, JA Southard, GD Williams, and RM Thom. 2001. *Assessment of Eelgrass (Zostera marina) Presence and Condition in Rich Passage during Summer 2000*. PNWD-3091. Prepared for the Washington State Department of Transportation by Battelle Marine Sciences Laboratory, Sequim, Washington.

Williams, G. D., J. West, M. Cordrey, and K. Ward. 1999. The physical, chemical, and biological monitoring of Los Peñasquitos Lagoon, 1998-99. Annual report prepared for the Los Peñasquitos Lagoon Foundation.

Williams, G.D., J. Desmond, J. Callaway, J. Terp, and K. Thorbjarnson 1998. System monitoring at the Oneonta tidal linkage restoration project, Tijuana Estuary 1997-98. Report to the California Coastal Conservancy.

Williams, G. D., J. B. Zedler, S. Trnka, J. Johnson. 1998. Tijuana River National Estuarine Research Reserve: Annual report on ecosystem monitoring for 1997. NOAA Technical Memorandum on the Tijuana River National Estuarine Research Reserve. NOAA National Ocean Service, Sanctuaries and Programs Division. Washington D.C.

Williams, G. D., G. Noe, J.Desmond. 1998 The physical, chemical, and biological monitoring of Los Peñasquitos Lagoon, 1997-98. Annual report prepared for the Los Peñasquitos Lagoon Foundation.

Williams, G. D., J. B. Zedler, S. Trnka, J. Johnson. 1997. Tijuana River National Estuarine Research Reserve: Annual report on ecosystem monitoring for 1996. NOAA Technical Memorandum on the Tijuana River National Estuarine Research Reserve. NOAA National Ocean Service, Sanctuaries and Programs Division. Washington D.C.

Williams, G. D., J. B. Zedler, B. Nyden, G. Noe, M. Cordrey, and J. Johnson. 1997. The physical, chemical, and biological monitoring of Los Peñasquitos Lagoon, 1996-97. Annual report prepared for the Los Peñasquitos Lagoon Foundation.

Williams, G. D., J. B. Zedler, S. Trnka, M. Cordrey, B. Nyden. 1996. Tijuana River Estuary National Estuarine Research Reserve: 1995 annual report on ecosystem monitoring. NOAA Technical Memorandum on the Tijuana River National Estuarine Research Reserve. NOAA National Ocean Service, Sanctuaries and Programs Division. Washington D.C.

Williams, G. D. 1996. The physical, chemical, and biological monitoring of Los Peñasquitos Lagoon, 1995-96. Final report prepared for the Los Peñasquitos Lagoon Foundation.

Williams, G. D., E. Olsen, J. Desmond, D. Gibson, and J. B. Zedler. 1995. Ecosystem responses to changes in tidal and sewage flows into Tijuana Estuary. NOAA Technical Memorandum on the Tijuana River National Estuarine Research Reserve. NOAA National Ocean Service, Sanctuaries and Programs Division. Washington D.C.

Williams, G. D. 1995. The physical, chemical, and biological monitoring of Los Peñasquitos Lagoon (20 Sept. 1994 - 20 Sept. 1995. Final Report to the Los Peñasquitos Lagoon Foundation. 27 pp + appendices. (November 1995)

Boyer, K., J. Zedler, S. Phinn, G. Williams, G. Noe, S. Trnka, and B. Fink. 1996. The status of constructed wetlands at Sweetwater Marsh National Wildlife Refuge. Annual Rpt. to the Cal. Dept. Trans. 51 pp + tab./fig/app.

Callaway, J., G. Williams, J. Desmond, S. Trnka, M. Cordrey, S. Meyer, and J. Zedler. 1996. Restoring California Coastal Wetlands. Annual Report for the USDI National Biological Service, San Diego, California.

Desmond, J., G. D. Williams, M. James, J. Johnson, J. Callaway, J. Zedler 1999. Tijuana River National Estuarine Research Reserve: Annual report on ecosystem monitoring for 1998. NOAA Technical Memorandum on the Tijuana River National Estuarine Research Reserve. NOAA National Ocean Service, Sanctuaries and Programs Division. Washington D.C.

Zedler, J. (editor), K. Boyer, J. Haltiner, G. Noe, L. Parsons, S. Phinn, D. Stow, and G. Williams (contributing authors in alph. order). 1995. The status of constructed wetlands at Sweetwater Marsh National Wildlife Refuge. Annual Report to the California Department of Transportation.

Presentations:

Southard, JA, DL Woodruff, AB Borde, PJ Farley, GL Williams, RM Thom, D MacLellan, and R Shuman. 2001. 2001. PNNL-SA-34667. “Fish distribution in submerged shallow water habitats using underwater videography in Puget Sound.” In *Puget Sound Research 2001 Proceedings* -- The Puget Sound/Georgia Basin Ecosystem: Status, Stressors, and the Road to Recovery. Bellevue, Washington, February 12-14, 2001.

Thom, RM, SL Blanton, DL Woodruff, MH Huesemann, GD Williams, and AB Borde. 2001. "Enhancing Carbon Sequestration in Coastal Vegetated Systems." PNWD-SA-5312. Invited presentation at the Eighteenth Annual International Pittsburgh Coal Conference, Newcastle, New South Wales, Australia, December 4-7, 2001.

Thom, RM, SL Blanton, DL Woodruff, GD Williams, and AB Borde. 2001. "Carbon Sinks in Nearshore Marine Vegetated Ecosystems." PNNL-SA-34668. Invited presentation at the First National Conference on Carbon Sequestration, Washington, D.C., May 14-17, 2001.

Thom, RM, AB Borde, SL Blanton, DL Woodruff, and GD Williams. 2001. "The Influence of Climate Variation and Change on Structure and Processes in Nearshore Vegetated Communities of Puget Sound and other Northwest Estuaries." PNNL-SA-34977. In *Puget Sound Research 2001 Proceedings--The Puget Sound/Georgia Basin Ecosystem: Status, Stressors, and the Road to Recovery*. Bellevue, Washington, February 12-14, 2001.

Thom, RM, AB Borde, GD Williams, JA Southard, SL Blanton, and DL Woodruff. 2001. "Effects of Multiple

Stressors on Eelgrass Restoration Projects." PNWD-SA-5434. In *Puget Sound Research 2001 Proceedings--The Puget Sound/Georgia Basin Ecosystem: Status, Stressors, and the Road to Recovery*. Bellevue, Washington, February 12-14, 2001.

Williams, G. D. 2001. A Comprehensive Assessment of the Central Puget Sound (King County) Nearshore Ecosystem: Historic Changes, Data Gaps, and Pending Threats. Puget Sound Research Conference. Seattle, WA.

Williams, GD, RM Thom, DL Woodruff, MC Miller, RK Kropp, AB Borde, AD Skillman, SL Blanton, J Brennan, and L Blackmore. 2001. "A Comprehensive Assessment of the Central Puget Sound (King County) Nearshore Ecosystem: Historic Changes, Data Gaps, and Pending Threats." PNNL-SA-34562. In *Puget Sound Research 2001* Proceedings--The Puget Sound/Georgia Basin Ecosystem: Status, Stressors, and the Road to Recovery. Bellevue, Washington, February 12-14, 2001.

Williams, G. D. 1999. Ecology and restoration of southern California wetlands: An overview. City of San Diego estuary and wetland resources and interpretive methods workshop, San Diego, CA.

Williams, G. D., J. West, S. Madon, J. Zedler. 1999. Integrating fish stomach contents and muscle isotopic composition to understand the Tijuana Estuary food web. Estuarine Research Federation (ERF) Biennial Meeting, New Orleans, LA.

Williams, G. D., J. Callaway, M. Wells, J. Jackson. 1999. Monitoring and managing Los Peñasquitos Lagoon's biological resources: Effects of a rapidly changing watershed. Coastal Zone '99, San Diego, CA.

Williams, G. D. 1998. Monitoring processes and problems in Los Peñasquitos Lagoon: Evolving management goals in a rapidly changing region. Invited presentation, Wetland Restoration Symposium, Southern California Academy of Sciences, Fullerton College, Fullerton, CA.

Williams, G. D., J. Desmond, J. B. Zedler. 1997. Distribution and abundance of nonindigenous fishes in San Diego Bay saltmarsh habitats. Southern California Academy of Sciences, Fullerton College Fullerton, CA.

Williams, G. D. and J. B. Zedler. 1996. Influence of tidal creek morphology on fish assemblage composition in created and natural salt marsh habitats in San Diego Bay. Southern California Academy of Sciences, Loyola Marymount University. Westchester, CA.

Williams, G. D. 1996. Evaluating restoration success: Assessing fish and invertebrate functions within an adaptive management framework. Training course in wetland restoration for U.S. Fish and Wildlife Service Employees. San Diego, CA.

Williams, G. and J. Zedler. 1995. Influence of habitat structure on fish assemblage composition in created and natural salt marsh channels in San Diego Bay. Estuarine Research Federation (ERF) Biennial Meeting, Corpus Christi, TX.

Williams, G. D. 1995. Marine fisheries and the loss of critical estuarine habitat in southern California: Efforts at protection and restoration. Center for Marine Conservation (CMC) Workshop, San Diego, CA.